GENERAL NOTES.

BOTANY.

DAVENPORT'S NOTES ON BOTRYCHIUM SIMPLEX.[1]—In 1821, the late President Hitchcock collected at Conway, Mass., specimens of a fern which he at first referred to *Botrychium lunaria* Sw. Two years later, however, he published in Silliman's Journal, a description of the species, giving to it the name of *Botrychium simplex*. That the species has had an uncertain place in pteridography, is evident from Mr. Davenport's account of its drifting in different editions of one work from *B. virginianum*, Sw., to *B. lanceolatum*, Angs., to *B. matricariæfolium*, A. Br. Part of this confusion is suspected by Mr. Davenport to have arisen from the fact that President Hitchcock really collected two distinct species, namely, *B. matricariæfolium* and *B. simplex*. This supposition is rendered the more probable from the occurrence of the two species in the vicinity of the original station.

In clearing up the matter, the author has appeared to avail himself most patiently of every means of discrimination in his power. A critical examination of all the specimens known to him to have been hitherto collected for *B. simplex*, is followed by an analysis of a portion of Milde's monograph of the genus Botrychium, and by diagnosis of *B. simplex* and *B. matricariæfolium*. Mr. Davenport's studies were carried on without a knowledge of Milde's paper, and his conclusions independently reached are the same as those held at one time by Milde. These may be stated as follows, in a translation of Milde's words:

"The characteristics of *B. simplex* lie:—

"1st. In the stalked sterile frond approximate to the rhizoma.

"2d. In the unsymmetrical segments of incomplete half-lunate forms.

"3d. In the kind and manner of the evolution of the forms."

Mr. Emerton's figures given in this work exemplify the above characters very fully. To this may be added the peculiarities of the spores. *B. simplex* has large spores closely covered with small points, never with warts.

B. matricariæfolium has spores which are thickly covered with large warts.

Mr. Davenport states in his prefatory note that "if the publication of these notes shall prove to be of any service to fern-students, they will owe it entirely to the generosity of Mr. Robinson." We have only to add to our notice the single remark that the typographical execution and the plates are of superior excellence, to indicate to our readers the indebtedness of fern students to both Mr. Davenport and Mr. Robinson.—*G. L. G.*

MOVEMENT OF AN AQUATIC SUBMERGED PLANT.—M. Rodier has recently made some interesting observations on the rhythmical movements of a well-known water-plant, *Ceratophyllum demersum*.

[1] *Notes on Botrychium simplex* Hitchcock. By GEORGE E. DAVENPORT, 1877. (22 quarto pages, with two plates, privately printed.)

The branches of this plant present two different aspects. Sometimes the whorls are very close to each other, the internodes being very short, and the leaves of the consecutive whorls resting on each other, make with the stem a very acute angle and form a compact mass. In other cases the internodes are elongated, the whorls more distant and the leaves become more and more nearly at right angles to the stem, until at length some of them actually point downwards. It is this last form which displays in the most striking manner the movements here described. Taking the axis at the moment when it is nearly erect, it is seen to bend regularly, curving more and more for about six hours, when it reaches its maximum of flexion; then straightening itself more slowly, it resumes its original position in about twelve hours. It next bends in a direction opposite to its first flexion, and in four hours it attains its maximum of inverse flexion, resuming its first position again in four hours. The total duration of an evolution is hence about 26 hours. Thus a young branch is vertical at 6 A. M., attains its maximum of flexion at noon, is again perfectly erect at midnight, attains its maximum inverse flexion at 4 A. M., and is again vertical at 8 A. M., etc. If examined carefully under favorable conditions it is seen that the movement of flexion takes place first in the higher or younger internodes, advancing thence with diminished intensity from above downwards; while, on the contrary, the movement of erection commences with the lower or older and ends with the upper internodes. The oscillations continue very apparent during several days, diminishing usually at the end of a certain time. Light does not appear to have any influence on the movements, which were carried on with as much vigor when the light was partially or entirely cut off, when it was thrown by means of a mirror from the opposite direction, or when it was made to pass through red glass. M. Rodier was unable to detect that the leaves have any motion of their own, independent of that of the stem.—*A. W. Bennett.*

THE EUCALYPTUS IN CALIFORNIA.—Last season the Central Pacific Railroad Co. planted 300,000 gum trees on the lines of their roads. This winter they intend to set out 700,000 more. Those set out by the Company around their shops in Sacramento last season having made such rapid and healthy growth, the Company are now planting 2,000 additional trees, placing them in every available nook and corner around the works and along the track by the slough.

GERMINATION OF ACORNS.—In this place (Lansing, Michigan) white oak acorns germinate in autumn. The radical pushes out and down into the leaves or soil often for three inches or more. The petioles of the cotyledons grow out from the shell about half an inch. This enables the plumule to find plenty of room to start in spring. It is quite common to find two embryos in one acorn, and three embryos are not very rare.—*W. J. Beal.*

ABSORPTION OF WATER BY ROOTS.—Vesque gives the following results of his experiments:

1st. The absorption of water by roots is not proportionate to the temperature of the leaves when the latter are surrounded by an atmosphere not saturated with moisture. At low temperatures it increases only slightly as the temperature rises; but at a certain degree fixed for each plant absorption increases rapidly, and at a maximum temperature becomes stationary; this maximum varies in different species.

2d. The absorption of water by roots is independent of the temperature of the leaves when these are surrounded by a saturated atmosphere, in the dark, and protected from calorific radiation.

3d. Calorific radiation in the dark acts in a very energetic manner upon transpiration in saturated air, and produces upon absorption the same effect as an elevation of temperature does upon leaves which are in dry air.—*From Annales des Sciences Naturelles, September*, 1877.

ZOÖLOGY.[1]

HOMOLOGIES OF THE EAR-BONES OF MAMMALS, ETC.—Professor G. Baraldi, in the *Atti della Societa Toscana di Scienze Naturali*, of Pisa, for 1877, has a paper on the homologies of the organs accessory to respiration in fishes, and the organs of hearing in the higher vertebrates, with special reference to the homologies of the branchiostegal and opercular bones of fishes, the tympanic bones and cartilages of the ear-conch of mammalia. A plate and tabular synopsis which accompany the paper show that he regards the hyomandibular of fishes, the columella of amphibia, reptiles and birds as homologues of the stapes of mammals; and the symplectic of fishes, suspensory cartilage of amphibia, ossicle of the tensor tympanica of reptiles and birds as homologues of the orbiculon or lenticulon of mammals. The bone homologous with the incus of mammals, are the quadrate (Gegenbaur), tympanic (Owen) of reptiles and birds; the quadrate or suspensorium of amphibia, the quadrate, hypotympanic, jugal, hypocotyleal, os quadrato-jugal as it has been variously called, of fishes. The articulare of fishes, amphibians, reptiles and birds are homologues of the mammalian malleus. The branchiostegal rays of fishes, the cartilaginous tympanic ring of amphibians, without homologue in reptiles and birds, is homologous with the tympanic ring of mammals. The interoperculum of fishes (no homologues in amphibians, reptiles and birds) is homologous with the annular or tubiform cartilage of mammals. The opercular of fishes, homologues wanting in amphibians, reptiles and birds, is regarded as homologous with the cartilaginous ear-conch of mammals. The sub-operculum of fishes (homologues absent in amphibians, reptiles

[1] The departments of Ornithology and Mammalogy are conducted by Dr. ELLIOTT COUES, U. S. A.